Spore-measurements are omitted throughout the entire work, the author regarding the existing records as untrustworthy. This has to be admitted to a certain extent, but could some of the spore-measurements from recent critical work have been included, the value of the descriptions would have been much increased. Everyone who has paid serious attention to the spores of the larger fungi knows that these structures are often of the greatest help for systematic purposes, and it is to be hoped that before long spore-characters will always form an essential part of the diagnosis.

Novelties in the form of new genera and species are few. Attention may be directed to the new genus Togaria, into which the author has placed all the terrestrial species of Pholiota. The recent additions to the British flora have been incorporated, but it is to be regretted that names now known to be synonyms still figure as independent species. A very large number of changes will be observed in the authorities quoted for the Agaricaceæ. This is due to the fact that the author has followed the Vienna rules with regard to the raising of subgenera to the rank of genera.

The book will be of most help to the beginner, and should prove a useful introduction to the study of Basidiomycetes. In the case of the Agaricaceæ several seasons' experience will be necessary before the student acquires much confidence in determinations derived from book descriptions. The diagrams at the end of Smith's synopsis should aid in grasping the generic features, and the numerous keys should save much time in identifying the species.

A. D. C.

OUR BOOK SHELF.

The Planning of Fever Hospitals and Disinfecting and Cleansing Stations. By Albert C. Freeman. Pp. viii+165. (London: The Sanitary Publishing Company, Ltd., n.d.) Price 7*s.* 6*d.* net.

THIS is a work compiled by an architect more particularly for reference purposes by other architects. It provides a practical guide to the planning of fever hospitals, disinfecting and cleansing stations. It contains a large number of plans showing in detail the construction of many fever hospitals which have been provided during recent years; and although the object of the author has been to place before his readers only those examples which demonstrate the most approved principles of design or other points of special interest, several of the plans reproduce the features of other designs and present no essential differences in the details of construction. Mr. Freeman devotes about thirty-five pages to a consideration of the general principles of design and construction in reference to fever hospitals, disinfecting and cleansing stations, and then devotes the rest of the book to the plans and more important features of construction above referred to. The scheme is a good one; but it is a question whether the purpose of the book might not have been even better served if the author had extended his statement upon the most approved features of design and construction, by giving the reader the benefit of more of the opinions and criticisms of one who has evidently made a special study of this matter, and then presenting the plans and details of construction of about a dozen existing hospitals which are specially commended.

The manual embodies much useful information, and it cannot fail to be of value to those who are called upon to design and construct hospital buildings. On the subject of disinfecting stations the work is not likely to be so generally useful. This section of the book stands in need of extension, and here and there of slight amendment. If, for instance, the various types of steam disinfectors are to be dealt with in such a book, the present statement is insufficient. One of the less well-known steam disinfectors (the Velox) is the only apparatus illustrated, and, indeed, the only one which is fully described. The description, moreover, is not so clear as it might be. On p. 148 it is stated that among the practical advantages claimed for this type of machine is the fact that there is no boiler to require scaling, whereas it is stated in the next paragraph that there is a boiler employed to raise steam.

Photographic Optics and Colour Photography, including the Camera, Kinematograph, Optical Lantern, and the Theory and Practice of Image Formation. By Dr. George Lindsay Johnson. Pp. xii+304. (London: Ward and Co., 1909.) Price 7*s.* 6*d.* net.

THE author is "examiner in photography and theoretical and applied optics to the Spectacle Makers' Company," and states that the primary object of this volume is to cover the ground of this company's examination. The first chapter deals with cameras in a popular rather than a scientific manner. The next two chapters constitute about half the volume, and deal with photographic lenses and the optics relating to their manufacture and use, including the consideration of shutters and artificial illumination. The remaining sections of the book deal with sensitometers, and the other subjects mentioned in the title.

With the exception, perhaps, of the strictly optical part, the various items receive very unequal treatment. Although a whole chapter is devoted to sensitometry, Hurter and Driffield's method, which is the only method stated to be "largely used," is disposed of in the following sentence:—"A sensitometer consisting of a rotating sector, furnished with a ring divided into steps, is now largely used in England, and was invented by Messrs. H. Hurter and Driffield." Dr. Hurter's Christian name was Ferdinand, and his is not the only name given incorrectly. We should like to know what the author means, when referring to the action of light upon a sensitive plate, by the statement that "the light acts on the gelatine substratum and starts freeing the hydrogen." There are many other parts that will certainly mislead the student as they now stand, as, for example, two pages devoted to what appears to even a careful reader to be an attempt to prove by calculation that the focal length of a lens has a direct influence on the relative proportions of the images of objects at different distances. We notice, too, errors in some of the illustrations. The volume needs a thorough revision.

Untersuchungen fossiler Hölzer aus dem westen Vereinigten Staaten von Nordamerika. By Dr. Paul Platen. Pp. xvi+155; with three plates. (Leipzig: Quelle and Meyer, 1908.) Price 3 marks.

THE Tertiary rocks of some of the south-western portions of the United States have been long known to be remarkable for the abundance and diversity of the silicified trunks of Coniferous and Angiospermous woods, often beautifully preserved, which they have yielded. In this dissertation Dr. Paul Platen, a pupil of Prof. Felix, of Leipzig, whose work on the anatomy of petrified woods is widely known, has described the structure of a considerable number of trunks, for the most part of Tertiary age, from California, Nevada,

Texas, Arizona and elsewhere, including also two specimens from Alaska. The great majority of the woods have proved to be Angiospermous, and two new genera, with many new species, are attributed to the families Quercineæ, Simarubaceæ, Araliaceæ and Platanaceæ among others.

Several Coniferous trunks of the Pityoxylon, Cupressinoxylon and other types are also described, and the author contributes some interesting diagnostic conclusions respecting a comparison of the structure of the wood of the recent Sequoia and Taxodium with the fossil stems known as Cupressinoxylon. Certain pathological features observed in some of the Coniferous woods, and in one case the presence of a parasitic fungal mycelium, are also noted.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

The Rate of Fall of Fungus Spores in Air.

IN the year 1905 I made what I believe was the first direct test of Stokes's formula for the fall of small spheres in air by using spores liberated spontaneously from the pilei of the mushroom and of allied fungi. The conclusion to which I then came was that the spores of these fungi fall at a rate which is roughly in accordance with Stokes's formula, and this fact was announced by Prof. A. J. Ewart in his translation of Pfeffer's "Physiology of Plants" (vol. iii., 1905, p. 416). The results of further observation were communicated to the Royal Society in 1907 in a paper which I subsequently withdrew.[1]

Recently, Messrs. Zeleny and McKeehan,[2] of the University of Minnesota, have announced that they have made a direct test of Stokes's formula by using lycopodium powder. Their method of measuring terminal velocity consisted in allowing the powder to fall in wide tubes and noting the rate of movement of the centre of the cloud. They came to the conclusion that, for lycopodium spores, the formula gives velocities 50 per cent. in excess of those observed.

In view of the fact that a correct determination of the rate of fall of small spheres in air has now become of considerable importance in connection with the cloud method used by Sir J. J. Thomson and Dr. C. T. R. Wilson for investigations upon the electronic charge, and also because the full details of my experiments will not be published for some months, I have thought it advisable to make a preliminary statement with regard to my methods and results.

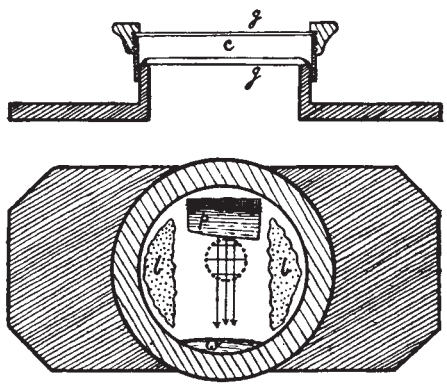
The following equation represents what is known as Stokes's law for the fall of small spheres in a viscous medium :—

$$V = \frac{2}{9}\frac{\rho - \sigma}{\mu} g a^2,$$

where V = the terminal velocity, ρ the density of the falling sphere, σ the density of the medium, g the acceleration due to gravity, a the radius of the falling sphere, and μ the viscosity of the medium. The new data which were required for testing the law for the fall of small spheres in air by my method were the terminal velocity, the density, and the radius of the fungus spores.

After a considerable amount of preliminary experimentation, the spores of *Amanitopsis vaginata* were chosen for a critical test of Stokes's law, for the following reasons :— (1) they are spherical, except for a tiny "tail," and smooth-coated; (2) they are sufficiently large, so that one can measure their diameters, which are about 10 μ, very accurately; (3) their density is almost that of water, and can be measured within 1 per cent. of accuracy; (4) they can easily be procured.

The average diameter of the spores was obtained by measurements made with the Poynting plate micrometer as applied to the microscope. The density of the spores was determined by the heavy fluid method. Drops containing the spores were placed in the tiny chamber of an apparatus used for counting blood corpuscles, and observations were made as to whether the spores rose or sank in the fluid. The terminal velocity of fall was found in the following manner. A small piece of a pileus of *Amanitopsis vaginata*, including portions of three gills, was placed in a compressor cell in the position shown at *p* in the accompanying figure. To prevent the falling spores from drying, two pieces of soaked blotting-paper or cotton wool, *b*, and a drop of water, *w*, were then added. Upon the cap being adjusted, the piece of fungus became fixed by slight compression and hermetically sealed in the disc-shaped chamber, of which the base and top were of glass (*g*). The compressor cell was then placed in a vertical position, so that the gills came to look downwards in the natural manner. Thus enclosed in the chamber, the gills continued to rain down spores for some hours. With a horizontal microscope having a magnification of about 25 diameters, a field was focussed just beneath the gills, and the spores were observed crossing the eye-piece



Plan and Section of the Compressor Cell.

lines. In the figure the field is shown by the dotted ring, and the course of three falling spores by arrows.

On viewing the field just below the gills, spores can be seen as distinct, but only just visible, minute, dark objects steadily crossing the field in a vertical direction. Every spore so falling is not in focus, but when the fungus material is in good condition spores in focus come into view at least every five seconds. Convection currents in the tiny chamber are reduced to a minimum, and produce no disturbing effect on one's observations. Even with the minute spores of *Collybia dryophila*, which take about eleven seconds to cross a field 4·55 mm. wide, the direction of fall is vertical, and there is practically no swerving from the course. The records of the velocity of fall of the spores were made with the aid of a large drum, which was driven by electricity, and was provided with a delicate regulator. To the recording fountain pen was attached an electric tapping key, by the depression of which with the finger the passage of each spore across the field of view became recorded on the drum paper. The drum records of the fall of 100 spores served to give the average time taken by the spores in falling a distance of 4·55 mm.

The following table gives a summary of the data obtained in testing Stokes's law. The velocities were the average velocities of 200 spores in Specimen I., of 100 in Specimen II., and of 50 in Specimen III. The densities are doubtless correct to within 1 per cent. The diameters are the average diameters for at least fifty spores. The

[1] The paper, which was partly botanical and partly physical in character, was accepted for publication in the Philosophical Transactions of the Royal Society on conditions which I was unable to accept. This paper, together with other researches, is in course of publication in a book called "Researches on Fungi. The Production, Liberation, and Dispersion of the Spores of Hymenomycetes treated Botanically and Physically, &c." (Longmans, Green and Co.).

[2] "An Experimental Determination of the Terminal Velocity of Fall of Small Spheres in Air." A paper read before the American Association for the Advancement of Science. Abstract in *Science*, March 19.